Developing Action Recommendations: Responding to the Threat of Invasive Earthworms in Forests of North America

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What the research tells us so far…

Potential impacts to forest soils and plants when non-native earthworms invade depend on ***forest type***.

forest type

moist sugar maple/ basswood forests

moist mixed hardwood/ conifer forests

dry mixed conifer/ hardwood forests

dry conifer forests

Greatest potential for large earthworm impacts

Smallest potential for large earthworm impacts

What the research tells us so far…

Loamy, moist ***soils*** support larger, more diverse earthworm populations than sandy, dry ***soils***.

soil type

moist sugar maple/ basswood forests

moist mixed hardwood/ conifer forests

dry mixed conifer/ hardwood forests

dry conifer forests

Greatest potential for large and diverse earthworm populations

Smaller potential for large or diverse earthworm populations

What the research tells us so far…

Nutrient-rich ***litter*** supports larger, more diverse earthworm populations than less palatable, nutrient-poor ***litter***.

litter type

moist sugar maple/ basswood forests

moist mixed hardwood/ conifer forests

dry mixed conifer/ hardwood forests

dry conifer forests

Greatest potential for large and diverse earthworm populations

Smaller potential for large or diverse earthworm populations

Plant indicators of earthworm-free or minimally impacted northern hardwood forests include:

Large Flowered Bellwort, Wild Oats
(*Uvularia grandiflora, U. sessilifolia*)

Spikenard
(*Aralia racemosa*)

Grape Fern, Goblin Fern
(*Botrychium* species)

Sugar Maple seedlings
(*Acer saccharum*)

Basswood seedlings
(*Tilia americana*)

Red Oak seedlings
(*Quercus rubra*)

Plant indicators of heavily earthworm-impacted northern hardwood forests include:

Pennsylvania Sedge (*Carex pensylvanica*)

Jack-in-the-Pulpit (*Arisaema triphyllum*)

A nearly unbroken sedge carpet

= decades-long earthworm impact.

Changes in plant communities result from loss of a thick litter layer and other changes in ***soil structure and chemistry***.

As numbers of earthworm ***species*** increase, so do earthworm ***ecological groups*** and impacts.

Strictly litter-, upper- and deeper-soil-dwellers, **plus** nightcrawlers present

Strictly litter- and upper- and deeper-soil-dwelling species present

Strictly litter- and upper-soil-dwelling species present

Strictly litter-dwelling species present

Greatest potential for large earthworm impacts

Smaller potential for large earthworm impacts

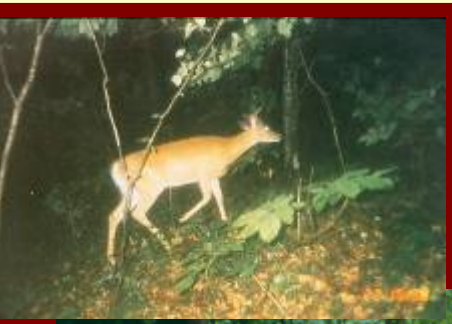
NEW & WORSE EARTHWORMS COMING!

Asian earthworms (*Amynthas* spp.) are:

1. becoming established in the eastern Great Lakes region;
2. only at a few sites in the western Great Lakes region;
3. showing potential for large impacts as ***single*** species;
4. showing potential to create ***"nothing grows here"*** syndrome!

Please report
suspected introductions to
Great Lakes Worm Watch
www.greatlakeswormwatch.org

Impacts of other animals can be increased when forests are heavily invaded by earthworms.



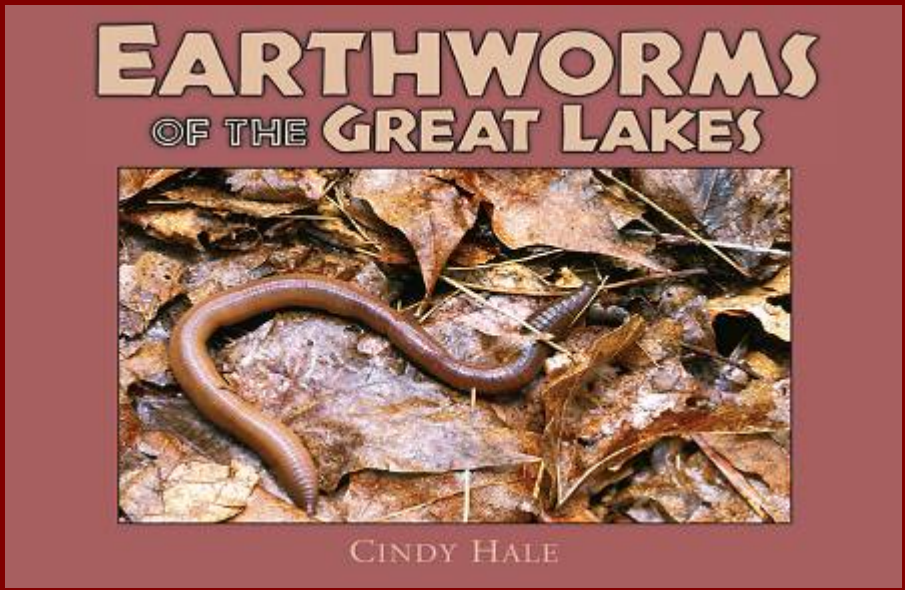
***Impacts of deer are more severe* in earthworm-invaded forests:**

- Deer preferentially feed on those plant species most impacted by earthworms.
- Decreases in overall numbers of understory plants due to earthworms result in proportionately greater impacts of deer on total plant populations.

Earthworm Identification Tools

Great Lakes Worm Watch

www.greatlakeswormwatch.org

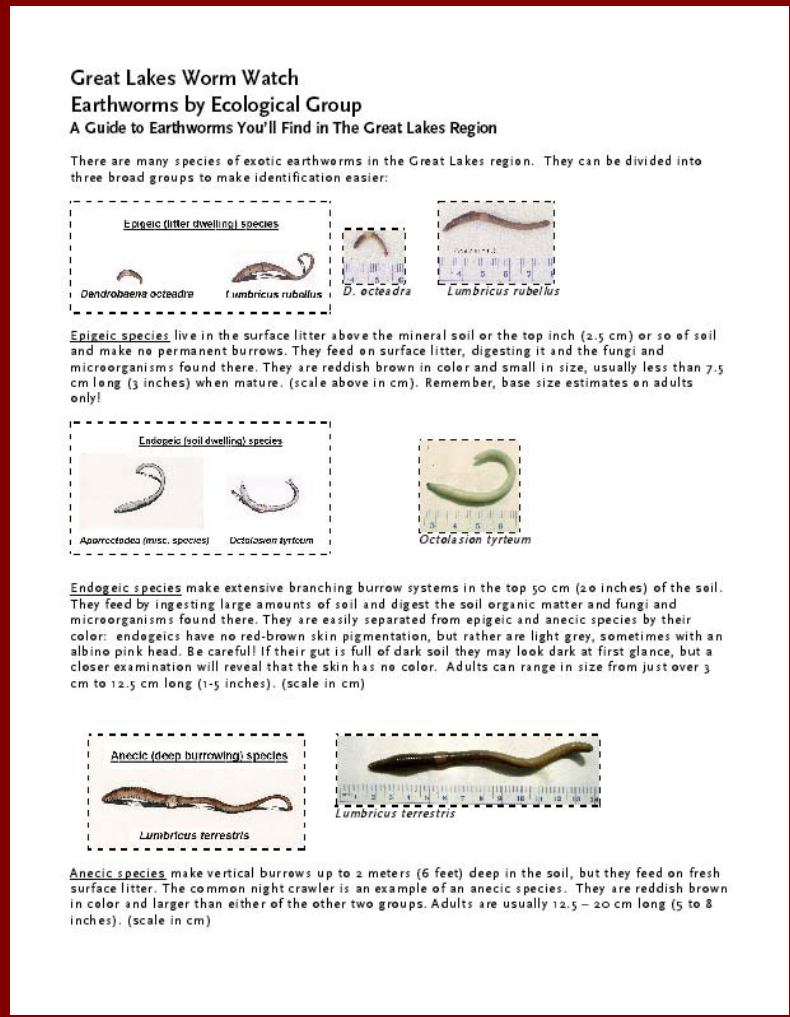


Background, illustrations, images, species descriptions, dichotomous key

Order a BOOK

Earthworms by ecological group

Download a PDF



Great Lakes Worm Watch
Earthworms by Ecological Group
A Guide to Earthworms You'll Find in The Great Lakes Region

There are many species of exotic earthworms in the Great Lakes region. They can be divided into three broad groups to make identification easier:

Epigeic (litter dwelling) species

Dendrobaena octaedra *Lumbricus rubellus*

D. octaedra *Lumbricus rubellus*

Epigeic species live in the surface litter above the mineral soil or the top inch (2.5 cm) or so of soil and make no permanent burrows. They feed on surface litter, digesting it and the fungi and microorganisms found there. They are reddish brown in color and small in size, usually less than 7.5 cm long (3 inches) when mature. (scale above in cm). Remember, base size estimates on adults only!

Endogeic (soil dwelling) species

Aporrectodea (misc. species) *Octolasion lyrteum*

Octolasion tyrteum

Endogeic species make extensive branching burrow systems in the top 50 cm (20 inches) of the soil. They feed by ingesting large amounts of soil and digest the soil organic matter and fungi and microorganisms found there. They are easily separated from epigeic and anecic species by their color: endogeics have no red-brown skin pigmentation, but rather are light grey, sometimes with an albino pink head. Be careful! If their gut is full of dark soil they may look dark at first glance, but a closer examination will reveal that the skin has no color. Adults can range in size from just over 3 cm to 12.5 cm long (1-5 inches). (scale in cm)

Anecic (deep burrowing) species

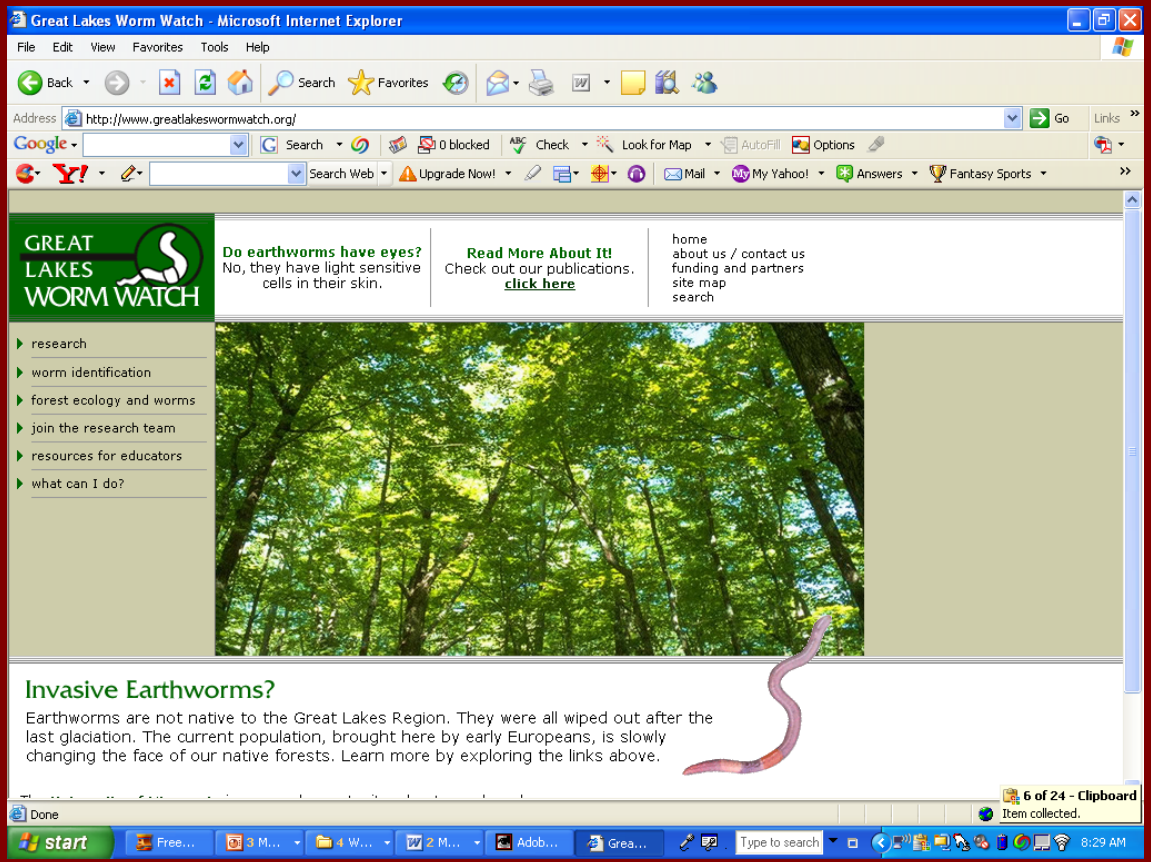
Lumbricus terrestris

Lumbricus terrestris

Anecic species make vertical burrows up to 2 meters (6 feet) deep in the soil, but they feed on fresh surface litter. The common night crawler is an example of an anecic species. They are reddish brown in color and larger than either of the other two groups. Adults are usually 12.5 – 20 cm long (5 to 8 inches). (scale in cm)

Ways to participate…

www.greatlakeswormwatch.org



Action Recommendations

Education	Vector Management	Policy
Anglers	Fishing bait	Tribal
Bait sellers	Compost	Federal
Composters	Mulch	State
Nurseries	Treads	County
	Soil	Local
	Other?	

NATIONAL FOREST FOUNDATION
Engaging Americans in caring for our National Forests

ENVIRONMENT AND NATURAL RESOURCES TRUST FUND

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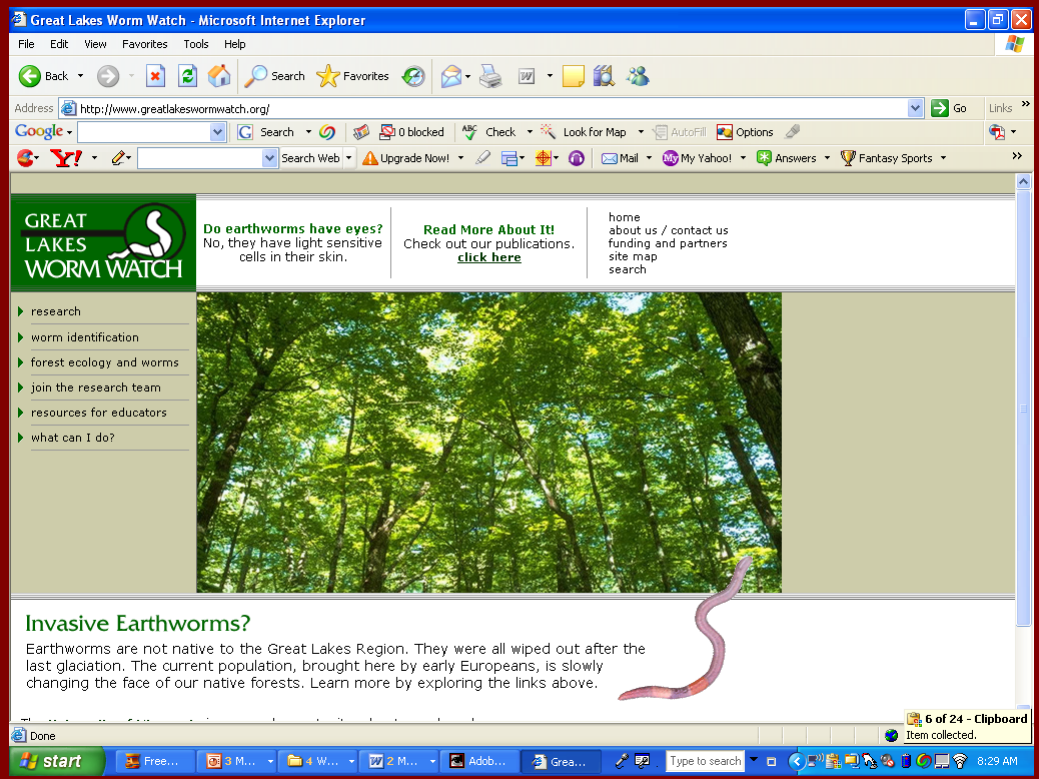
Other ideas? It's really *not* too late….*yet*!

www.greatlakeswormwatch.org



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